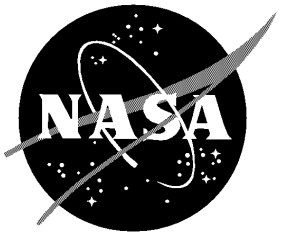

National Aeronautics
and Space Administration

January 21, 1998
NRA 98-217-01

Research Announcement

Technology Development for the Constellation X-ray Mission

Proposals Due: **March 9, 1998**

OMB Approval No. 2700-0087

Technology Development for the Constellation X-ray Mission

NASA Research Announcement (NRA)
Soliciting
Proposals for Research
Proposals Due March 9, 1998

NRA 98-217-01
Issued: January 21, 1998

Engineering Procurement Branch
National Aeronautics and Space Administration
Greenbelt, MD 20771

Technology Development for the Constellation X-ray Mission

This NASA Research Announcement (NRA) solicits proposals for Technology Development for the Constellation X-ray Mission. The purpose of this program is to support scientific research efforts which define, develop, and demonstrate Constellation-X critical technologies prior to seeking new start authorization. This announcement is not for the acquisition of instruments but for the development of technologies. Technology development design concepts are required to demonstrate the technology's feasibility via a breadboard or prototype according to the schedule specified in each model contract in Appendix C.

Participation in this program is open to all categories of domestic and non-U.S. organizations, industry, educational institutions, other nonprofit organizations, NASA centers, and other Government agencies. The proposals that are received by the deadline, noted below, will be evaluated by scientific peer reviews, and selections are anticipated in TBD. Further details relevant to this program are included in the appendices to this Announcement. The complete text of the NRA and appendices are available through the World Wide Web at the URL address:

"**http://procurement.nasa.gov/EPS/GSFC/class.html**

Notification of intent to propose is required by NASA and shall be submitted to Ms. Grady by close of business TBD. Such notifications are for planning purposes only.

Appendix A provides technical and program information in the general area in which proposals are sought, plus amendatory guidance to Appendix B, applicable only to this NRA. Appendix B contains the basic guidance needed for preparation of solicited proposals in response to an NRA. Appendix C provides the forms required for proposal submission including model contracts. The following items, likewise, apply only to this Announcement:

Identifier:	NRA 98-217-01
Obtain additional information and hard copies of NRA from:	Ms. Jean Grady Technical Officer Code 701.1 NRA 98-217-01 NASA/Goddard Space Flight Center Greenbelt, MD 20771 Phone (301) 286-5349 Fax (301) 286-1752 jean.grady@gsfc.nasa.gov
Proposal Deadline:	March 9, 1998

Proposal Copies Required:	Mail 17 copies (one with original signature) to: NASA/Goddard Space Flight Center Engineering Procurement Office Building 11, Room S215F Attn: Ms. Janet Langweil Mail Code 217 Greenbelt, MD 20771
Selecting Official:	Dr. Alan Bunner Science Program Director NASA Headquarters

Your interest and cooperation in participating in this effort are appreciated.

Appendix A: **Description of Program**

Appendix B: **Instructions for Responding to NASA Research Announcements**

Appendix C: **Cover Page Form , Representations and Certifications and Model Funding Instruments (Contracts)**

TECHNOLOGY DEVELOPMENT FOR THE CONSTELLATION X-RAY MISSION

I. PROGRAM SCOPE

The Constellation X-ray Mission (previously known as HTXS) is under study as a major multi-user X-ray astronomy facility as part of NASA's Structure and Evolution of the Universe Program. It will offer users a unique combination of large effective area, angular resolution and broad energy range compared with previous x-ray astronomy facilities. NASA is planning a new start and the beginning of the Constellation-X development phase, phase C/D, in approximately 2004. A program of technology development is being initiated now to develop and demonstrate the Constellation-X critical technologies prior to seeking new start authorization.

II. MISSION DESCRIPTION

Constellation-X is now in the pre-phase A or concept development stage. As part of the pre-phase A studies, a variety of mission architectures and launch options will be investigated. The concept that has been developed the farthest to date, and has been used to demonstrate mission feasibility, consists of a series of six independent medium size spacecraft with identical complements of instruments. They will be launched into a L2 orbit with intervals of approximately 3 to 4 months between launches. The scientific instrumentation of each spacecraft consists of a spectroscopic telescope with high resolution spectroscopy subsystems in the focal plane that operate in the band from 0.25 to 10 keV plus a focussing Hard X-ray Telescope (HXT) system that extends the energy range to at least 40 keV.

Each satellite contains a Spectroscopy X-ray Telescope (SXT) which in the current baseline is a 1.3 m diameter set of highly nested grazing incidence optics with a micro-calorimeter array or equivalent at the focal plane. A Grating System (or equivalent) mounted behind the telescope will intercept up to fifty percent of the incoming X-rays and disperse them onto a CCD array offset from the micro-calorimeter array. The anticipated spatial resolution of the SXT optics is 15" HPD or less; their focal length will be in the range 8-15 m, with 8.5m used for the current baseline mission.

Proposers should assume that the spacecraft, SXT optics, coolers and the optical bench structures will be provided by NASA. The nominal satellite design includes a mechanism that extends the distance between the telescope and detector (of both the spectroscopy telescope and the HXT) from a compacted configuration for launch to provide a nominal focal length of 8.5 meters (9.0 for the HXT) for orbital operations. If proposers require a larger minimum focal length in order to meet the specifications, that should be stated clearly in the proposal.

More detail on the Constellation-X can be found at the following web site,

``http://constellation.gsfc.nasa.gov".

The objective of this effort is to demonstrate readiness of the Constellation-X technologies by the construction and testing of functioning system models or prototypes. The prototype technology shall meet the flight performance specifications while functioning in the laboratory and in a simulated space environment and shall be consistent with the mission programmatic guidelines**.**

III. SCOPE OF WORK

1. Statement of Work

The contractor shall provide all effort required to define concepts for the Constellation-X instrument subsystems, develop the critical technologies, and ultimately demonstrate a Technology Readiness Level (TRL) of 6 (see Attachment A) by providing a prototype demonstration that meets the performance specifications provided in Paragraph 2. As a point of departure, the contractor shall form its concept(s) to be consistent with the six spacecraft Constellation-X mission architecture as described below. However, the technologies proposed should be , to the maximum extent possible, adaptable to a range of focal lengths (8 to 15 meters) and number of spacecraft (6 or less).

To support the technology development effort, the contractor shall:

a) Define a design concept that integrates the proposed technology into an instrument subsystem or integrated system

b) Produce quantitative evaluations for the technology capabilities including a comparison of its performance with the Constellation-X performance requirements

c) Perform breadboarding or prototyping as appropriate to demonstrate the feasibility of fabricating the proposed technology as part of Constellation-X.

d) Develop and refine schedules, and identify milestones, to complete the technology development within the contract duration

e) Define and track technology metrics that will be used to show progress toward the final performance specifications

Additionally, to support incorporation of the technology into the mission study efforts, the contractor shall:

f) Define and characterize the requirements the technology will have for mission accommodations. These include, but are not limited to weight, envelope, power, pointing accuracy and stability requirements, alignment requirements, telemetry

rates, etc. The technology accommodation requirements shall be determined to the extent practicable during the basic contract. Updates shall be provided as the technology evolves and the accommodation requirements change or are refined.

g) Attend and support the Constellation-X Facility Science Team and mission study meetings. Approximately three (in total) meetings, which will be held either in Greenbelt, MD or Cambridge, MA, will need to be supported for the basic contract. In addition, four meetings should be assumed annually for each option.

h) Support mission architecture trade studies and the impact of design changes on the mission architecture and spacecraft interfaces.

2. Performance Specifications and Programmatic Requirements

2.1 Performance Specifications

The nominal specifications for the Calorimeter or equivalent, Grating/CCD System or equivalent, and HXT are provided below. Proposals are expected to offer technologies that satisfy or exceed them. These specifications apply to each of six payload complements, consistent with the current mission baseline. Proposed technologies should meet these specifications and be adaptable to a variety of mission configurations and orbits.

Specifications are provided for several parameters. The proposer may offer a set of specifications that differs moderately from the specifications if inferior than specified performance with respect to one parameter is compensated for by better than specified performance in another.

2.1.1 Calorimeter or Equivalent Performance Specifications

The performance specifications for the calorimeter or equivalent are provided in Table 2. These specifications apply to each of the six Constellation-X payloads.

Table 2

Calorimeter or Equivalent Performance Specifications	
Energy Range	0.3 keV or lower to 10 keV or higher
Energy Resolution	2 eV FWHM over 1 keV to 5.9 keV band
Quantum Efficiency	$\geq$ 90% at 1keV and 5.9 keV $\geq$ 50% over 0.3 keV to 10 keV band
Spatial Resolution	$\leq$ 5 arc sec
Field of View	$\geq$ 2.5 arc min (min)

Maximum Count Rate	$\geq$ 1000 counts/sec
Mass (Total)	$\leq$ 30kg (TBR)
Power (average)	Cooled Portion: minimal Total: $\leq$ 100 watts (TBR)

The quantum efficiency specified is for the detector itself (i.e. does not include filters on the cryostat). A cooler for the calorimeter or equivalent will be developed and provided under a separate activity by NASA. The cold temperature provided will be dependent upon the power, and to a lesser extent, the mass and size, of the cooled portion of the detector. Detectors that can otherwise meet the calorimeter performance specification that do not require cooling can be up to 150 kg (TBR) and use 210 watts (average power, TBR).

2.1.2 Grating/CCD System or Equivalent Performance Specifications

The specifications in Table 3 for the beam efficiency of the instrument and the lower end of the energy band should be considered the minimum acceptable values. Achieving larger area and/or lower energy is extremely desirable and will enhance the utility of the facility to the community of observers. Similarly it is desirable to achieve better energy resolution than specified in Table 3.

The specifications in Table 3 apply to each of the six Constellation-X payloads.

Table 3

Grating/CCD System or Equivalent Performance Specifications	
Energy Range	0.25 keV to 2 keV
Energy Resolution	Better than 0.05A FWHM in first order
Beam Efficiency	$\geq$ 0.2 (TBR)
Mass	$\leq$ 100 kg (TBR)
Power	$\leq$ 75 watts (TBR)

2.1.3 Hard X-ray Telescope Performance Specifications

For each spacecraft, the HXT may consist of either a single telescope with detector or a larger number. If multiple smaller telescopes and detectors are offered, proposers should take account of the reduction in sensitivity that results from the increase in background when the image is a summation of multiple focal planes. There may be additional constraints due to configuration requirements.

Specifications are provided, in Tables 4 through 6, for several telescope parameters at both the HXT system level, and for the detector and optics subsystem technologies. Proposals offering both optics and detectors may apportion the requirements between the telescope and detector differently from these guidelines as long the system performance requirements are met.

The specifications provided in Tables 4 through 6, apply to each of the six Constellation-X payloads.

Table 4

Hard X-ray Telescope System Performance Specifications	
Effective Area	250 sq. cm at 40 keV
Focal Length	9.0 m (TBR)
Spatial Resolution	$\leq$ 1arc minute half power diameter
Energy Range	$\leq$ 6 keV to $\geq$40 keV
Field of View	$\geq$ 8 arc minute over 6 to 40 keV band (TBR)
Energy Resolution	$\leq$20% FWHM over 6 to 30 keV band $\leq$ 10% FWHM above 30 keV
Background per nominal detection cell area (detection cell = HPD spot size x number of modules)	$\leq$ 1 x 10E-5 cts/sec/keV
Mass (Including Shielding)	$\leq$ 130 kg
Power (average, including heaters)	TBD

Table 5

Hard X-ray Telescope Optics Performance Specifications	
Effective Area	≥ 285 sq. cm at 40 keV (TBR)
Spatial Resolution	≤ 1 arc minute half power diameter
Energy Range	≤ 6 keV to ≥ 40 keV
Field of View	≥ 8 arc minute over 6 to 40 keV band (TBR)
Mass	≤ 80 Kg (TBR)

Table 6

Hard X-ray Position Sensitive Detector Performance Specifications	
Energy Resolution	≤20% FWHM over 6 to 30 keV band ≤ 10% FWHM above 30 keV
Spatial Resolution	Nominally 15 arc seconds FWHM (telescope HPD must be over sampled by a factor of 4)
Energy Range	≤ 6 keV to ≥40 keV
Field of View	8 arc minute FWHM (TBR)
Quantum Efficiency	≥ 90% over 6 to 40 keV band (TBR) (including K escape events)
Background	≤ 2x10E-4 cts/cm2/sec/keV
Mass (Including Shielding)	≤ 50 kg (TBR)
Power (average including heaters)	TBD

The specifications in Table 4 for the effective area of the telescope and the upper end of the energy band should be considered the minimum acceptable values. Achieving larger area and/or higher energy is extremely desirable and will enhance the utility of the facility to the community of observers. Similarly it is desirable to achieve better energy resolution than specified.

With the telescope at a nominal distance of 9.0 m from the detector, shielding is required at the detector to limit the field of view and reduce background from particles and off source electromagnetic radiation. The detector design should include this shielding. The mass limits specified for the detector includes the shielding as well as any cooling systems or gas systems if used.

The background affecting source detection is determined by the telescope resolution as well as by background count rates in the detector. Proposals offering to develop both telescope and detector technology may be able to offset higher detector background against a superior telescope and detector resolution. Nevertheless, proposals for the detector should take account of the need for shielding and reduced background.

2.2 Programmatic Requirements

The proposed technologies must be consistent with overall mission schedule and with the programmatic goal to minimize the cost of the mission. The time required from the mission New Start (authority to proceed with the flight build) to the delivery of the first flight qualified instrument subsystem is expected to be no more than eighteen months. The remaining flight units would be expected to be delivered periodically over next two years.

3. Delivery Requirements and Delivery Schedule

The deliverable requirements and delivery schedule are detailed in the model contracts included in Appendix C of this NRA. Three (3) model contracts have been provided. Each is a firm fixed price schedule. Contract NAS5-98037 is provided as a model for University or Non-profit organization. Contract NAS5-98038 is provided as a model for commercial organizations (both large and small businesses). S-10256G is provided as a model for Government agencies (both DOD and Non-DOD).

NOTE: The above funding instruments are not applicable for NASA proposals, funds shall be suballotted.

3.1 Monthly Status Report

The provider shall submit monthly Status Reports of highlights of work accomplished in the last month. The report shall be in narrative in format and brief and informal in content. The report shall present a summary of the progress, problem areas and on-going activities from the previous month. It shall include plans for the following month, the current technology development milestone schedule, and action items. As required, progress shall be additionally reviewed by informal teleconferences and informal ad hoc site visits.

3.2 Status Reviews

The provider shall support a review of their progress every six months. The reviews will take place at the provider's site or be held via teleconference. The reviews shall cover all aspects of the technology development's status and plans. Technology metrics shall be presented to show progress toward the final performance specifications.

3.3 Final Technical Reports

At the end of the basic contract and at the end of each option, the provider shall submit a written report the covers all of the work performed during the phase.

3.4 Continuing Communications

Regular and informal communications between the technology development team and the government are required. The technology development team shall support periodic telecons and ad hoc, agreed-upon site visits.

IV. PROPOSAL GUIDELINES AND EVALUATION CRITERIA

Proposals are solicited under this NRA for technology development efforts for the Constellation X-ray Mission in the following three (3) areas:

X-ray Calorimeter or Equivalent
Grating/CCD System or Equivalent
Hard X-ray Telescope

Separate technical proposals may be submitted for one or more of the above areas. An executive summary for each technical proposal is required in addition to the technical proposal volume. Offerors proposing for the Hard X-ray Telescope may propose for the telescope optics only, for the detector only, or for the entire Hard X-ray Telescope system. Offerors proposing for the entire HXT system shall include a summary of how the two subsystems perform together as an integrated system.

Therefore, all proposals submitted must specify:

- The technology to be developed and the schedule for the technology demonstration.

- The performance projected for the proposed technology. The relationship between the projected performance and the proposed technology must be clearly demonstrated.

- Technological advances to be pursued as an inherent element of achieving the projected performance.

- The proposed plan for managing and organizing the total development and demonstration effort, including identification of the program manager and his/her authority and teaming arrangements (if any).

- The proposed time schedule for performance by phases or parts of the program showing interrelationships between the phases or parts. The time schedule must

include a description of the extent to which the proposed technology concept development can meet the Constellation X-ray Mission's schedule requirements for technology demonstration.

- This item does not apply to Small Businesses. A subcontracting plan, which includes a Small Disadvantaged Business subcontracting goals of 8% of the proposed contract value is required. For example, if the proposed contract value is $10,000,000 and the proposed goal is 10% of the proposed contract value and the proposed value of all subcontracts is $2,000,000, then the small disadvantaged business subcontracting goal in the plan would be 50%.

"EVALUATION FACTORS" as described in Appendix B, Section H, are superseded as follows:

The principal elements in evaluating a proposal are Technical Merit/Relevance, Competence and Experience of the Investigator and Team, and Price and Management with the first being of greatest weight and the last being of the least weight.

The determination of a proposal's Technical Merit/Relevance is based on a combination of sub-elements:

1. The extent to which the proposed technology can meet the Constellation X-ray Mission measurement requirements. This sub-element includes the following:

   a. Overall scientific and technical merit.
   b. Uniqueness of the proposed technology development in the sense that it:

   - Meets the performance requirements
   - Leads to significant reductions in instrument size, mass, power and cost.
   - Provides an approach that significantly enhances the state-of-the-art to enable critical enhancements to the scientific investigation.

1. Overall standing among similar proposals available for evaluation and/or evaluation against the known state of the art.

2. Potential for successful technology transfer to secondary applications, including commercial applications, in other areas.

3. The extent to which the proposed development effort can meet the Constellation X-ray Mission's schedule requirements for technology demonstration.

The Competence and Experience of the Investigator and Team evaluation includes:

1. Technical Performance – This area considers the offeror's compliance with technical requirements and performance standards for previous and present work. For hardware and hardware systems, this includes compliance with process requirements (such as product assurance) and control systems (such as configuration management) as well as the performance requirements for the delivered hardware or system and also whether design life was achieved. For services and support, the quality of the service or support is considered. The offeror's performance previous and/or current technology development efforts will be considered. This includes technology development concepts, designs, and prototype hardware.

2. Schedule Performance – This area considers how well the offeror has met completion dates. This includes interim deliverables or milestones such as periodic technical and progress reports, system designs, prototype hardware.

3. Investigator/Team Resumes - This area considers the qualifications, capabilities, and experience of the proposal's principal investigator and team based on a review of resumes submitted by the offeror for the proposed P.I. and each team member. Resumes shall not exceed two pages in length and shall not be included in the page count for the technical volume.

The Price and Management evaluation includes:

1. The price evaluation of the proposed effort includes the relationship of the proposed price to available funds, as well as its fairness and reasonableness.

2. The offeror's compliance with the Small and Small Disadvantaged Business Subcontracting goal of 8% shall be evaluated unless the offeror is a small business.

VI. PROGRAM MANAGEMENT INFORMATION

This NRA hereby reserves the right of NASA to award multiple contracts for all or part of the effort described in Section III of this appendix and in one, all, or any combination of the three technology development areas listed in Section IV of this appendix.

Funds are not currently available for awards under this NRA. The Government's obligation to make award(s) is contingent upon the availability of appropriated funds from which payment can be made and the receipt of proposals that NASA determines are acceptable for award under this NRA.

The following are anticipated funding profiles for each area of technology development. Each contract will be divided into a basic contract with options. The duration of the Basic contract will be 7 months and advancement to Option 1 will be predicated on receipt of program funding for FY99. Advancement to subsequent options will be predicated on performance and the demonstration of the required Technology Readiness Level (TRL). The duration and TRL for the basic contract and each option is provided below:

Table 1
Duration, Technology Readiness Requirements, and Funding Profile for Constellation-X Technology Development Contracts

Table 1a
Calorimeter or Equivalent

	Basic	Option 1	Option 2	Option 3	Total
Duration	7 mos	12 mos	12 mos	12 mos	43 mos
Goal		TRL4	TRL5	TRL6	
Funding Profile ($K)	915	2185	3300	3400	9800

Table 1b

Grating/CCD System or Equivalent

	Basic	Option 1	Option 2	Total
Duration	7 mos	12 mos	24 mos	43 mos
Goal		TRL5	TRL 6	
Funding Profile ($K)	285	815	2500	3600

Table 1c

Hard X-ray Telescope

	Basic	Option 1	Option 2	Option 3	Total
Duration	7 mos	12 mos	12 mos	12 mos	43 mos
Goal		TRL4	TRL5	TRL6	
Funding Profile ($K)	465	1935	2000	2700	7100

VII. SUPPLEMENTARY PROPOSAL PREPARATION GUIDANCE

1. Cover Page:

The "Transmittal Letter or Prefatory Material" section of Appendix B is modified as follows:

The first page of the proposal after the transmittal letter should be the Cover Page that must be signed by an official of the principal proposing the institution empowered to commit the institution to carry out the proposed work if the proposal is selected.

2. Representation and Certifications:

A completed and signed set of the representations and certifications, provided in Appendix C, must be attached to the proposal:

3. Proposal Length:

The "Length" section of Appendix B is revised as follows:

The maximum length of each proposal's technical volume is limited to 25 non reduced, single spaced typewritten pages. Each side of a sheet of paper containing text or figures is considered a page. Use type font 10 point or larger, minimum 1-inch margins, and standard 8.5x11 inch paper.

The Executive Summary shall be limited to 2 pages.

4. Proposal Costing Detail:

With regard to the price detail desired, the guidelines outlined below should be followed. Sufficient proposal price detail and supporting information will facilitate a speedy evaluation and award. In particular, dollar amounts proposed with no explanation (e.g., Equipment: $58,000, or Labor: $110,000) will cause delays in evaluation and contract award. Therefore, the proposal pricing information should be sufficiently detailed to allow the Government to identify costed elements for evaluation purposes. Generally, the Government will evaluate price reasonableness. An example of a Proposal Summary is shown below. The summary is only an example and does display the desired detail. Each

category should be explained. Offerors should exercise prudent judgment as the amount of detail necessary varies with the complexity of the proposal.

Direct Labor

Labor costs should be segregated by titles or disciplines with estimated hours and rates for each. Estimates should include a basis of estimate such as currently paid rates or outstanding offers to prospective employees. This format allows the Government to assess cost reasonableness by various means including comparison to similar skills at other organizations.

Indirect Costs

Indirect costs should be explained to an extent that will allow the Government to understand the basis for the estimate. Examples of prior year historical rates, current variances from those rates, or an explanation of other basis of estimates should be included.

Where costs are based on allocation percentages or dollar rates, an explanation of rate and application base relationships should be given. For example (see the following page), the base to which the General and Administrative (G&A) rate is applied should be explained as: application base equals total costs before G&A less subcontracts.

Other Costs

Each significant cost category, such as travel and equipment purchases, must be detailed and explained.

Proposal Summary

The format for a price summary is given in Appendix C, and must be submitted with the proposal. The proposing institution may also submit the budget in the format of its own choosing for additional information.

5. Renewal Proposals

Renewal proposals are not applicable to this NRA.

6. Selection for Award:

When a proposal is selected for award, negotiation and award will be handled by GSFC.

APPENDIX B

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS

Part 1852.235-72
NASA Federal Acquisition Regulations (FAR) Supplement (NFS)
Version 97-0, Effective August 31, 1997.

Accessible at URL
<http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm>,
open Part 1852.228 to 1852.241 from menu.

(JANUARY 1997)

A. General.

(1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a preaward synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRA's contain programmatic information and certain requirements which apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information which applies to responses to all NRA's.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. NASA will determine the appropriate instrument. Contracts resulting from NRA's are subject to the Federal Acquisition Regulation (FAR) and the NASA FAR Supplement (NFS). Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRA's; however, it is requested that proposals conform to the guidelines in these instructions.

NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

B. NRA-Specific Items. Several proposal submission items appear in the NRA itself: the unique NRA identifier, when to submit proposals, where to send proposals, number of copies required, and sources for more information. Items included in these instructions may be supplemented by the NRA.

C. Proposal Content. The following information is needed to permit consideration in an objective manner. NRA's will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) *Transmittal Letter or Prefatory Material*.

(i) The legal name and address of the organization and specific division or campus identification, if part of a larger organization;

(ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;

(iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;

(iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;

(v) Identification of other organizations that are currently evaluating a proposal for the same efforts;

(vi) Identification of the NRA, by number and title, to which the proposal is responding;

(vii) Dollar amount requested, desired starting date, and duration of project;

(viii) Date of submission; and

(ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization(unless the signature appears on the proposal itself).

(2) *Restriction on Use and Disclosure of Proposal Information*. Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following Notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the Notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the Notice.

Notice

Restriction on Use and Disclosure of Proposal Information

The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract(or other agreement) is awarded on the basis of this proposal, the Government shall have the right to use and disclose this information (data) to the extent provided in the contract(or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) *Abstract*. Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) *Project Description*.

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance, relation to the present state of knowledge, and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) *Management Approach*. For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and arrangements for ensuring a coordinated effort should be described.

(6) *Personnel*. The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications, and any exceptional qualifications should be included. Omit social security number and other personal items which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) *Facilities and Equipment.*

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non research purposes should be explained.

(8) *Proposed Costs*.

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages, fringe benefits, equipment, expendable materials and supplies, services, domestic and foreign travel, ADP expenses,

publication or page charges, consultants, subcontracts, other miscellaneous identifiable direct costs, and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the price proposal to provide identification and estimated cost of major capital equipment items to be acquired, purpose and estimated number and lengths of trips planned, basis for indirect cost computation(including date of most recent negotiation and cognizant agency), and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(9) *Security*. Proposals should not contain security classified material. If the research requires access to or may generate security classified information, the submitter will be required to comply with Government security regulations.

(10) *Current Support*. For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(11) *Special Matters*.

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines.

(ii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

D. Renewal Proposals.

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

E. Length. Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. Few proposals need exceed 15-20 pages. Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments.

F. Joint Proposals.

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals which specify the internal arrangements NASA will actually make are not acceptable as a means of establishing an agency commitment.

G. Late Proposals. A proposal or modification received after the date or dates specified in an NRA may be considered if doing so is in the best interests of the Government.

H. Withdrawal. Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances which dictate termination of evaluation.

I. Evaluation Factors

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.
(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these which are integral factors for achieving the proposal objectives.
(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.
(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds.

J. Evaluation Techniques. Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases, proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

K. Selection for Award.

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the contracting officer who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The Contracting Officer may request certain business data and may forward a model award instrument and other information pertinent to negoitation.

L. Cancellation of NRA. NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

(End of provision)

Standard Forms

- Proposal Cover Page
- Proposal Price Summary
- Representations and Certifications
- Model Contracts

CONSTELLATION X-RAY MISSION TECHNOLOGY DEVELOPMENT PROGRAM

Log No. _____

Date Received: _____

Do not write in the shaded area.

NRA #: _____

Date Submitted: _____

INSTRUMENT DISCIPLINE (Please check one box appropriate to this proposal):

[ ] CALORIMETER	**[ ] GRATING/CCD**	**[ ] HARD X-RAY TELESCOPE**
[ ] HARD X-RAY TELESCOPE OPTICS ONLY	**[ ] HARD X-RAY TELESCOPE DETECTOR ONLY**	**[ ] OTHER**

Proposal Title: _____

Principal Investigator (Name): _____

Institution: _____

Address: _____

City/State/Zip Code: _____

Telephone: (_____)_____ **Fax**: (_____)_____

E-Mail Address: _____

Institution Contact or Business Representative:

Telephone: (_____)_____ **Fax**: (_____)_____

Signature: _____

Please list all names and institutions below (use separate sheet if necessary)

Co-Investigators: **Institutions**:

Proposed Duration of Project: _____ months

Desired Start Date: _____ **End Date**: _____

Budget Request:

Basic	Option 1	Option 2	Option 3 (if applicable)
$_____	$_____	$_____	$_____

Total Funding Requested: $_____

PROPOSAL PRICE SUMMARY

FROM: _____ TO _____

TITLE OF INVESTIGATION:

PRINCIPAL INVESTIGATOR / INSTITUTION:

		NASA USE ONLY	
	A	**B**	**C**
1. Direct Labor (salaries, wages, and fringe benefits)	_____	_____	_____
2. Other Direct Costs: a. Subcontracts	_____	_____	_____
b. Consultants	_____	_____	_____
c. Equipment	_____	_____	_____
d. Supplies	_____	_____	_____
e. Travel	_____	_____	_____
f. Other	_____	_____	_____
3. Indirect Costs	_____	_____	_____
4. Other Applicable Costs	_____	_____	_____
5. Subtotal--Estimated Costs	_____	_____	_____
6. Less Proposed Cost Sharing	_____	_____	_____
7. Total Price	_____	_____	XXXXXXXX
APPROVED BUDGET	XXXXXXX	XXXXXXX	_____

Instructions

1. Provide a separate Proposal Price Summary sheet for the basic and each option of the proposal research. Option 2 of the Grating/CCD effort requires a separate summary sheet for each year.
2. Offerors estimated costs should be entered in Column A. Columns B and C are for NASA use only. Column C represents the approved price.
   Provide in attachments to the price summary the detailed computations of estimates in each category, along with any narrative explanation required to fully explain proposed price.

---------- ADDITIONAL INSTRUCTIONS ON FOLLOWING PAGE ----------

INSTRUCTIONS FOR PRICE SUMMARY

1. Direct Labor (salaries, wages and fringe benefits). Enclosures should list number and titles of personnel, amount of time devoted to the contract, and rates of pay.

2. Other Direct Costs.

    a. Subcontracts - Enclosures should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting this effort.
    b. Consultants - Identify consultants to be used, why they are necessary, time to be spent on the project, and rates of pay.
    c. Equipment - List separately and explain the need for items of equipment exceeding $1,000. Describe the basis for the estimated cost.
    d. Supplies - Provide general categories of needed supplies, the method of acquisition, estimated cost, and the basis for the estimate.
    e. Travel - List the proposed trips individually, describe their purpose in relation to the contract, provide dates and destinations where known, and explain how the cost for each was derived.
    f. Other - Enter the total of any other direct costs not covered by 2.a through 2.e. Enclose an itemized list explaining the need for each item and the basis for the estimate.

3. Indirect Costs. Identify indirect cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. If unapproved rates are used, explain why and include a computational basis for the indirect expense pool and corresponding allocation base for each rate.

4. Other Applicable Costs. Enter the total of any other applicable costs not covered by instructions 1 through 3. Enclose an itemized list explaining the need for each item and the basis for the estimate.

5. Subtotal -- Estimated Costs. Enter the sum of items 1, 2.a through 2.f, 3, and 4.

6. Less Proposed Cost Sharing (if any). Enter the amount proposed, if any. If cost sharing is based on specific cost items, identify each item and amount in enclosures.

7. Total Price. Enter the total after subtracting item 6 from item 5.

ATTACHMENT A

Technology Readiness Levels

TRL 1 – Basic principles observed and reported
TRL 2 – Technology concept and/or application formulated
TRL 3 – Analytical and experimental critical function and/or characteristic proof-of-concept
TRL 4 - Component and/or breadboard validation in the laboratory
TRL 5 – Component and/or breadboard validation in relevant environment
TRL 6 - System/subsystem model or prototype demonstration in a relevant environment (ground or space)
TRL 7 – System prototype demonstration in a space environment
TRL 8 – Actual system completed and "flight Qualified" through test and demonstration (ground or space)
TRL 9 – Actual system "flight proven" through successful operations